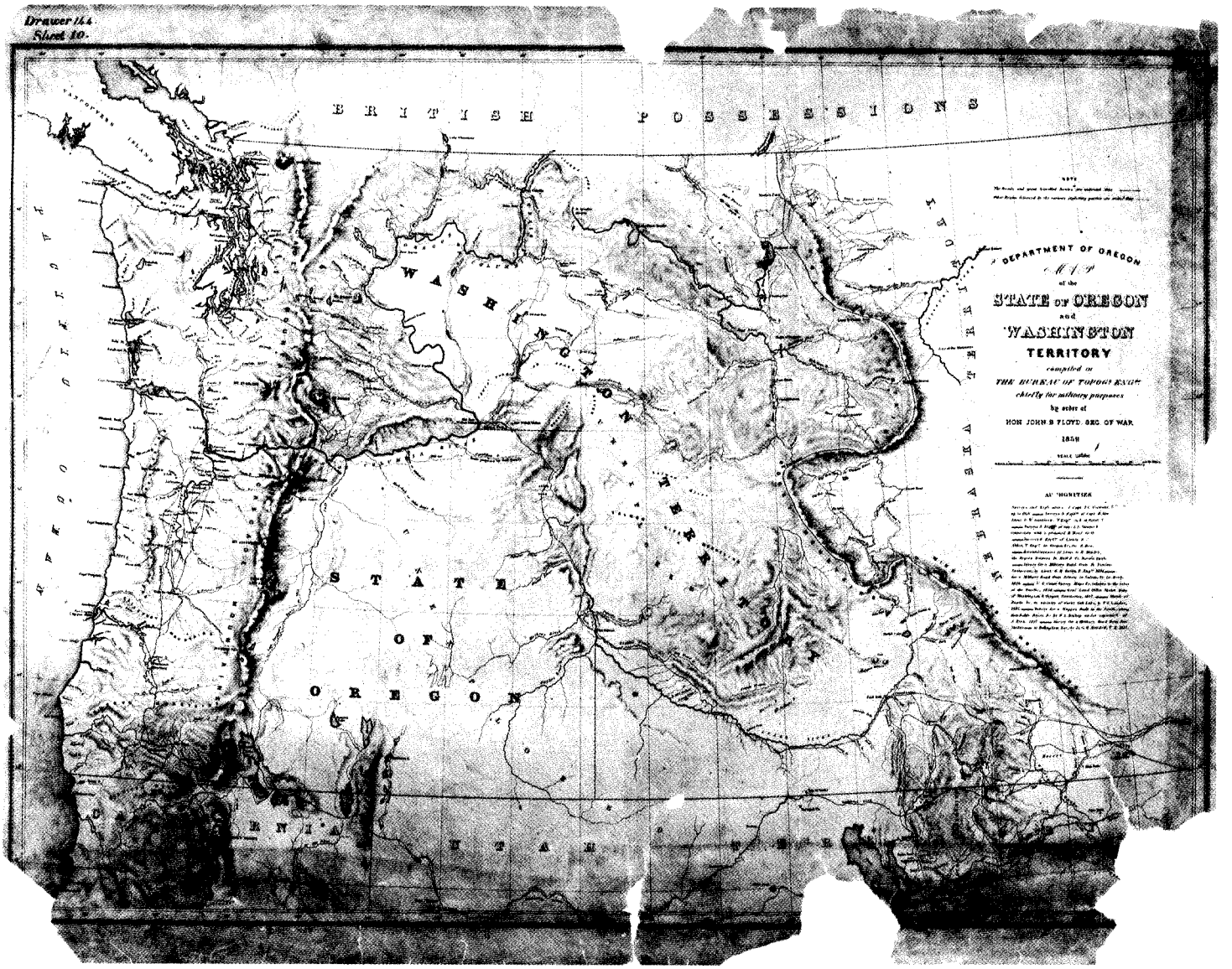


1859 map of the Pacific Northwest.

Chapter 4 Project Management and River Improvements, 1880 to 1920

Organization and Management of Portland Office

When the Chief of Engineers suddenly ordered Major Gillespie east to take charge of the New York District in July 1881, Lieutenant Charles F. Powell was promoted to the rank of captain and transferred from the Cascades to Portland to serve as engineer in charge. Captain Powell remained in Portland for nearly seven years, longer than any district engineer before or since. His period of service remains one of the most noteworthy in the history of the district.

Operations now progressed in an area roughly 400 miles on each side, from the Canadian border to Coos Bay and from the mouth of the Columbia to the upper Snake. Captain Powell oversaw the removal of rapids at Lewiston, Idaho; construction of large jetties on the Oregon Coast; survey and improvement of numerous rivers in Washington Territory; continued work on the Willamette and Columbia Rivers; and further construction on the Cascades Canal. Appropriations had reached an all-time high shortly before Captain Powell's appointment, and by the time he departed they had doubled. Shortly after he headed up the Portland Office, the job of building the jetty at the mouth of the Columbia was added to his responsibilities and became the most important project undertaken by the Portland District in its first 50 years. For three years, Captain Powell skillfully supervised these far-flung projects, aided by one military assistant, and five civilian assistant engineers.

above: Captain Charles Powell

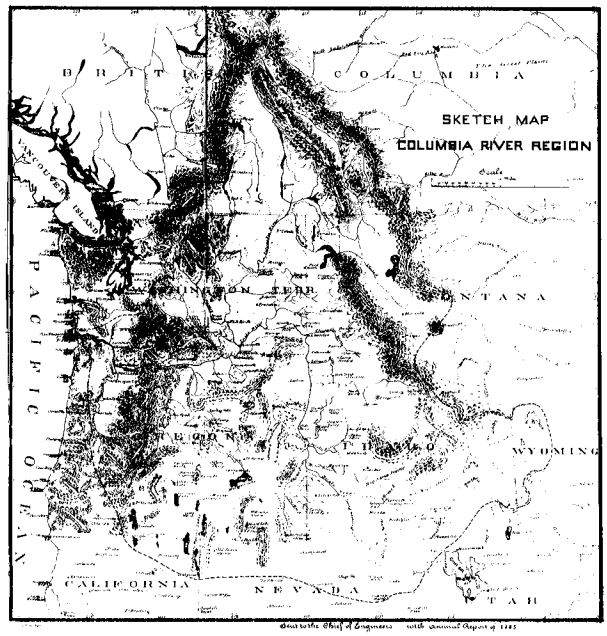
The work load became so heavy that, from 1884 to 1926, two offices were needed in Portland, each separately commanded by an engineer officer.[1] An indication of the confidence which Captain Powell's superiors placed in him was expressed when the Office of the Chief of Engineers returned the responsibility for the construction of the Cascade Canal and Locks to him. This project had been shifted to Major William Jones in 1884 in anticipation of Captain Powell's heavy responsibility in supervising work on the jetty at the mouth of the Columbia. From October 1886 until he left in April 1888, Powell had full responsibility for the two most challenging projects in the Portland District in its first fifty years.

In 1887, the Chief of Engineers ordered another change. He established an additional Portland Office under Captain Willard Young. Responsibilities for works in the Pacific Northwest were then divided as follows: Captain Powell retained the works at the mouth of the Columbia, at the Cascades, and on rivers in Washington Territory; Captain Young was assigned to projects on the Oregon Coast; and Major William Jones, who had headed the second office in Portland since 1884, retained responsibility for improvements on the Clearwater, Cowlitz, Snake, Columbia, and Willamette Rivers.

In 1888, Captain Powell was transferred from Portland and Major Thomas H. Handbury, another outstanding district engineer, succeeded him. Major Handbury was assigned the same responsibilities which Captain Powell had assumed. The other two officers retained their same assignments, except that Tillamook Bay was added to work on the coast under Captain Young.

In December 1889, two offices again operated in Portland when Major Jones and Captain Young departed. Major Handbury and Captain Thomas W. Symons, the successor to Captain Young, absorbed their assignments. Handbury retained the responsibility for the mouth of the Columbia and the Cascades Canal—which he held until he left the district in November 1893—as well as work on the Willamette and lower Columbia Rivers and on the Cowlitz River. Under the assignment, "Improvement of Certain Rivers and Harbors in Oregon and Washington," Captain Symons, who had performed the notable survey of the upper Columbia several years earlier, took charge of all other projects in the Northwest. With minor variations, Handbury and Symons held these responsibilities until November 1893 when Major James C. Post replaced Handbury. In 1895, two new officers came to Portland: in November, Captain Walter L. Fisk replaced Symons and in December, Captain Harry Taylor succeeded Post. The following spring, on 30 April 1896, the Corps organized the Seattle District and Taylor became the first district engineer there. The formation of the Seattle District cut the territory of the old Portland District almost in half.

Captain Fisk immediately assumed the former duties of Taylor in the Portland District and in Novembver 1897 was promoted to major. At the same time, a second Portland office



1885 map of the Pacific Northwest, highlighting the Columbia River region.

was again established. From this date until 1926, two districts operated continuously in Portland. The assignments between them varied. The two districts in Portland were officially listed according to the type of work authorized, such as "Improvement of the Lower Willamette and Columbia Rivers, from Portland, Oregon to the sea," for example.

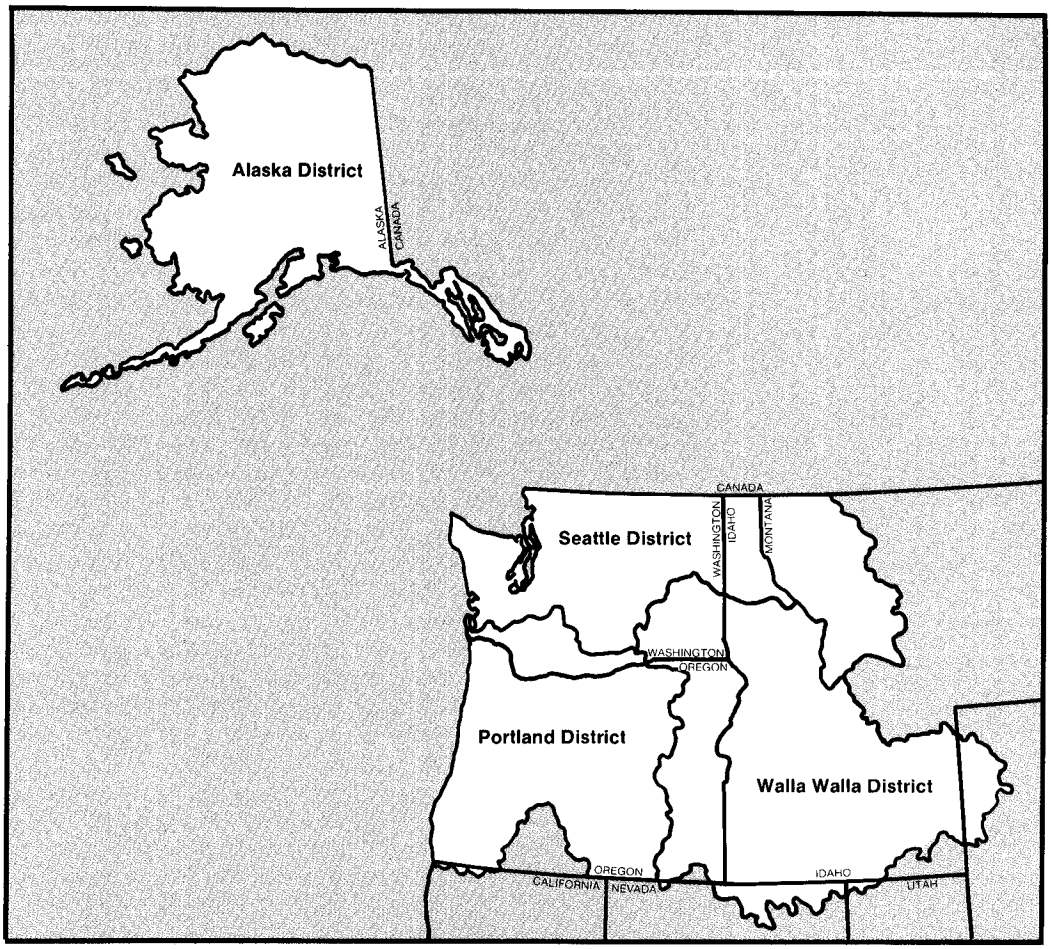
While the local offices evolved, the national organization of the Corps also underwent changes.[2] The district became the main focus for planning, construction, and operation of the public works activity of the Corps. Involvement in local public works projects usually occurred after a local request to Congress and a subsequent authorization to begin a preliminary study. The next step was a detailed survey and a plan with cost estimates. The final stage, if Congress approved the plan and appropriated funds, consisted of carrying out the plans. Only rarely did the Corps initiate action and rarely did it attempt to solve problems beyond a local setting.

While Congress formulated policy and the Corps carried it out, district and national officers often found it in their interest to influence policy or encourage local interests to lobby Congress in support of favored projects. For instance in 1882, Captain Powell advised local officials on strategy in seeking congressional approval for new projects and increased appropriations for existing work on the Columbia River. Facing a lack of funds for Cascade Canal work in 1884, Powell wrote directly to members of the Oregon congressional delegation, pleading for an all-out effort to save the appropriation.

Leadership responsibilities rested with the military officers who normally served three-year tours. Frequent rotation helped to insure objectivity in dealing with the various local interest groups involved in a project. The chain-of-command process in reaching final decisions helped protect the district officer from local pressures in controversial issues. The military engineer's position in the government hierarchy also shielded him from premature criticism in another way: he could legitimately refuse requests for information on his preliminary reports or surveys until first submitted to the Chief of Engineers and Congress.

Until the creation of the division level of authority in the late 1880s, the office of the Chief of Engineers exercised tight control over the operation of individual districts—or engineer offices as they were called until 1908. Except for emergency situations, the district engineer had to obtain prior authority from the Chief's office for all hiring, all travel by the engineer within the district, and all expenditures greater than $5.00—no matter how immediate the need. The district engineer was required to submit detailed monthly reports of operations to the Chief, to keep accurate and minute accounts of all funds received and disbursed, and to maintain precise records of all government property.

Such detailed accounting led occasionally to absurd extremes. In one case, the Office of the Chief of Engineers informed Major Gillespie that "on comparison of your accounts for disbursement for first quarter 1879 with your Property Returns for first quarter 1879, it is found that 500 envelopes, and ½ dozen thumb tacks, purchased on Voucher 45, do not appear on your Return for Examinations and Surveys on the Pacific Coast."[3] Gillespie was ordered to explain promptly the discrepancy in his accounts. The officer in charge always had to be ready to justify his expenditures. When Major Gillespie requested permission to buy some office furniture for a new Corps officer assigned to his district, the Chief of Engineers reluctantly approved the purchase but stated that he felt the cost was excessive



The North Pacific Division of the U.S. Army Corps of Engineers

and "indulged the hope that you [Gillespie] will procure that which will answer every purpose at a much reduced price."[4] Gillespie responded with a lengthy defense of his conduct in the matter, stating that such items were simply more expensive on the West Coast than in the East.

In 1884, a middle layer of organization between the district and the Office of Chief Engineers was created: Division Engineers. While the Chief of Engineers served as a board of appeal and liaison with Congress for district projects, he became less involved in the day-to-day activities of the districts, except in response to a complaint sent directly to the Chief's office. To provide more clearly defined oversight, engineer divisions were established to direct, review, and advise the district officer in matters pertaining to the engineering work in his responsibility. Before the creation of the North Pacific Division in 1901, which included the Portland and Seattle Districts, the Portland District came under the Pacific Division headquartered in San Francisco.

District officers did not always need to be expert in specific engineering problems because their chief function was management and decision-making. Civilian experts on the district staff often provided the engineering expertise, and civilians always constituted the bulk of Corps employees. In addition, the Chief of Engineers formed boards of engineers on an *ad hoc* basis to review specific plans of district engineers for major projects.

As one might expect, the management style of the various engineer officers or district engineers varied. For example, Major Wilson emphasized proper office decorum of his staff. In February 1877, he ordered that no tobacco be used during office hours, that the office staff must wear coats at all times, must keep the office neat and clean, and show courtesy to each other and all visitors. He hoped that "while discipline must be maintained we can carry on our duties in a manner that will be agreeable to all."[5] All engineer officers, beginning with Gillespie, issued standing orders that employees not discuss the work of the office or field projects with outsiders and that they refer any inquiries to the engineer in charge. Captain Powell maintained a constant concern for the conduct of his men because of concern for their safety as well as for the success of the improvements undertaken. In response to an anonymous complaint against one of his assistant engineers, Powell assured the Chief of Engineers that

> *it is my standing order that any employee who gets drunk must be discharged. There is an Oregon statute, enacted at my request, which prohibits the sale of liquor within 3 miles of a government work . . . . Our work here on rapid rivers*

and a stormy coast is arduous and dangerous. Within the last four weeks, one man, at Coos Bay, on duty, was drowned; one man at the Cascades, on duty, was drowned; Lieut. Price, on duty, had his leg broken, and ankle severely bruised; and three men at Yaquina were drowned in crossing the Bay . . . . Besides steady habits, energy and courage are required in the principal employees.[6]

Employee relations were a continuing problem for the Portland District Engineers. Unemployed engineers from throughout the nation continually solicited positions in the Portland Office. Since there were few or only very specialized openings, the district engineer spent much time politely rejecting these requests. When the district engineer did hire for engineering or drafting positions, he usually based his choice on recommendations from his fellow district officers. Individual project supervisors usually hired and directed their workforce, but the district engineer often involved himself in the process and acted as the arbiter of labor-relations disputes. Job seekers or disgruntled employees would sometimes write their Congressmen, the Chief of Engineers, or even the President, seeking positions or a redress of their grievances. The district engineer had to respond to these importunings or complaints, no matter how pointless the request or petty the accusation, justifying his actions to the satisfaction of higher authority. Most complaints represented minor matters, involving alleged violations of hours legislation, improper employment of aliens, personal favoritism to certain employees, unjust firings, or other disciplinary actions.

Both Gillespie and Powell concerned themselves deeply with the engineering aspects of the projects in their charge and wrote voluminous, detailed instructions and suggestions to their assistant engineers out in the field. In return, they insisted that their assistants submit comprehensive weekly and monthly field reports. These two military engineers also wrote lengthy and descriptive annual reports, reflecting intense involvement with their work.

In a remarkable letter to a subordinate civilian engineer, Major Gillespie clearly stated his view of how an engineer should operate within the Corps:

The Department requires a strict observance of the orders and authority given by it, and no departure can be made from them without first bringing the matter before it in an official way and receiving its sanction. We are especially prohibited from making expenditures beyond an authorized limit, with the expectation that they will be approved by a future authority. The principle, imparatively followed is confine yourself to the authority at hand. This applies to every kind of duty, and I call your special attention to its observance. What is adopted as authorized remains in force until changed or modified by the source from which the work or authority emanated. . . . I can well see that circumstances may arise when a literal or strict compliance with existing orders may not conform to the resident engineers ideas of economy of time or money, still as long as the orders exist and no manifest injury is done to the service by complying with them, they must be observed; but such observances can in nowise reflect upon the character and ability of the Engineer in the results arising from the orders under which he acts—his reports are his defense.[7]

If a district engineer carried out his responsibilities unsatisfactorily to his superiors, he could expect censure. The situation of Major William A. Jones is a case in point.[8] Major Jones had been assigned to establish a second Portland Office in 1884 when the expanded work load became too much for one officer to supervise effectively. At that time, the Portland Office had major jetty works underway at several harbors on the Oregon Coast, the beginning of the massive program at the mouth of the Columbia, as well as the ongoing improvements and maintenance of the Willamette and Columbia Rivers and their tributaries. At the time Major Jones came to Portland, he and the existing engineer officer, Captain Powell, divided the responsibilities. Powell kept the mouth of the Columbia project, the coastal improvements, and all work below Portland on the Willamette and Columbia; Jones was given the canal at the Cascades and the upper Columbia and Willamette works. Until 1886, the Cascades Canal project consisted of river improvements with little done at the canal site proper.

The River and Harbor Act of 5 August 1886, funded renewed work on the canal itself; but the acting Chief of Engineers, Colonel John G. Parke, apparently doubted Major Jones' ability to direct such work. In a later defense of his conduct, Colonel Parke stated that he

was not willing to assume the responsibility of recommending or authorizing the approval of a project for work of this character [the Cascades Canal] of an officer whose administrative skill, capacity, and ability were not satisfactory to me; but in order that there should be no further delay in the work, I was perfectly ready to make a recommendation in the case.

Parke convinced the Secretary of War to transfer the Cascades Canal project from Major Jones to Captain Powell on 6 October 1886.[9] Jones angrily objected and demanded a full hearing. Jones called the circumstances of his removal "extraordinary":

I was removed summarily by telegraph, without previous warning whatever,

and the work was placed in charge of my junior on duty at this station, who had been previously consulted in the matter.

Furthermore, he complained that he was left with work worth only $500,000 while Captain Powell now had responsibility for projects valued at $6,000,000:

The inference from these circumstances is absolutely rigorous that this change resulted from grave fault on my part. Nothing else could justify placing me in such a humiliating position.

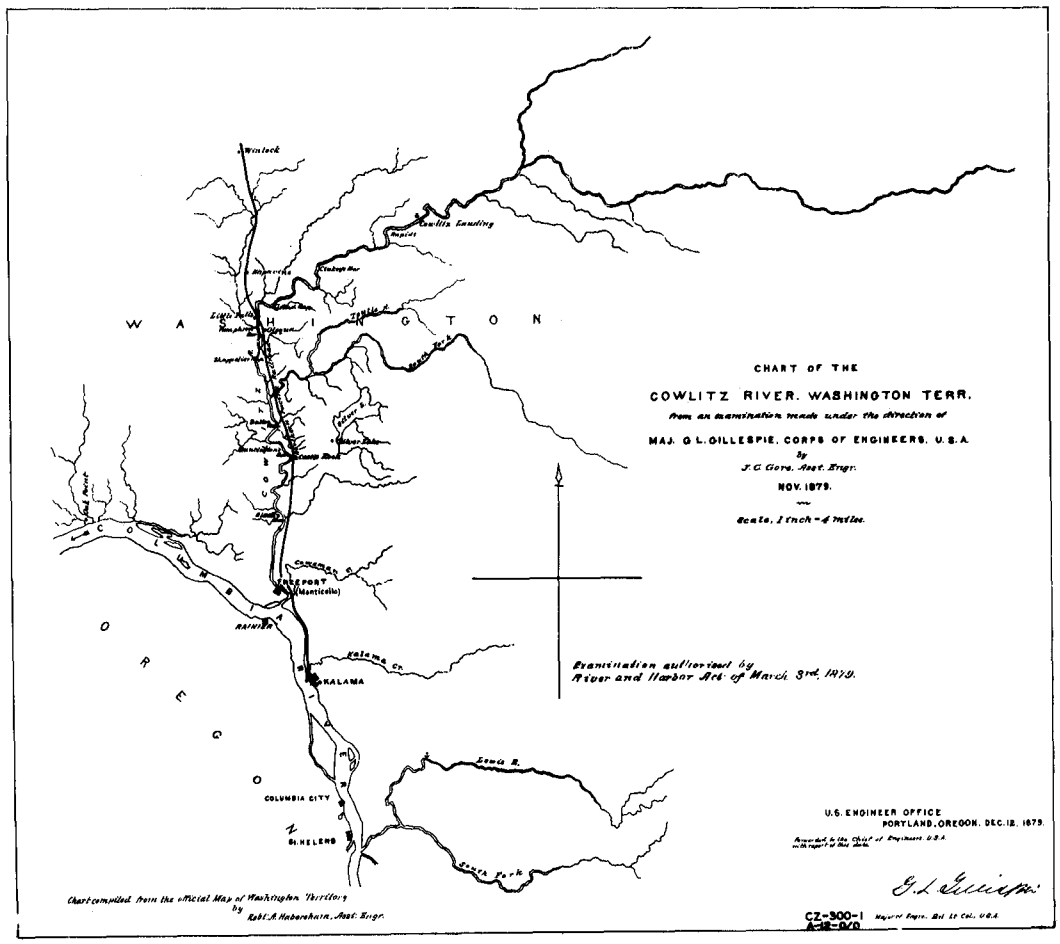
At this point, Jones received support from public bodies and politicians in Oregon. Afraid that the transfer of responsibility for the canal would delay the project, the Portland and The Dalles Boards of Trade and Oregon's congressional delegation expressed confidence in Jones' ability and called for his reinstatement. Oregon's powerful Senator John H. Mitchell initiated a Senate investigation of the whole matter which, in part, directed the Secretary of War to furnish full copies of all correspondence relative to the case.

The Secretary of War assured the Senate that "the transfer as submitted to me by Colonel Parke in a personal interview" was necessary, and rather than delaying Corps projects in the Northwest would actually improve their operation. The Chief of Engineers pointed out to Mitchell that "Captain Powell, now restored to the charge of the work, is not unfamiliar with its details, having been in charge from July 1881, to October, 1884, . . . to the entire satisfaction of this Department." Major Jones remained in Portland another three years with his diminished duties unchanged. Apparently his career was not permanently affected by the affair, for he went on to serve as the St. Paul District Engineer and was ultimately promoted to brigadier general.[10]

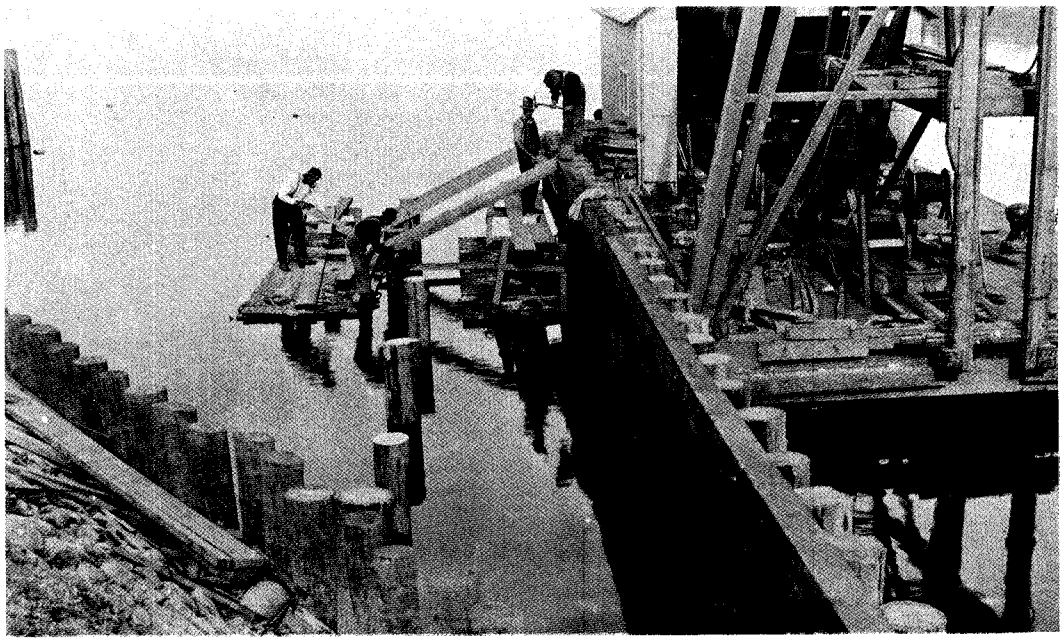
Continued River Work

Within ten years after the establishment of the Portland Office in 1871, improvements were being made to rivers throughout the Pacific Northwest as economic life in the region quickened following the depression of the mid-1870s. Beginning in the 1880s, work was undertaken in Washington Territory. The most important river improved in Washington was the Cowlitz, the largest tributary of the Columbia below the mouth of the Willamette. Major Gillespie described the Cowlitz as "quite an important little river with good commercial prospects."[11] An appropriation of $2,000 in 1880 provided for snagging operations, and in the fall of that year the snagboat went to work. It removed 325 snags, 122 overhanging trees, and two sunken scows.[12]

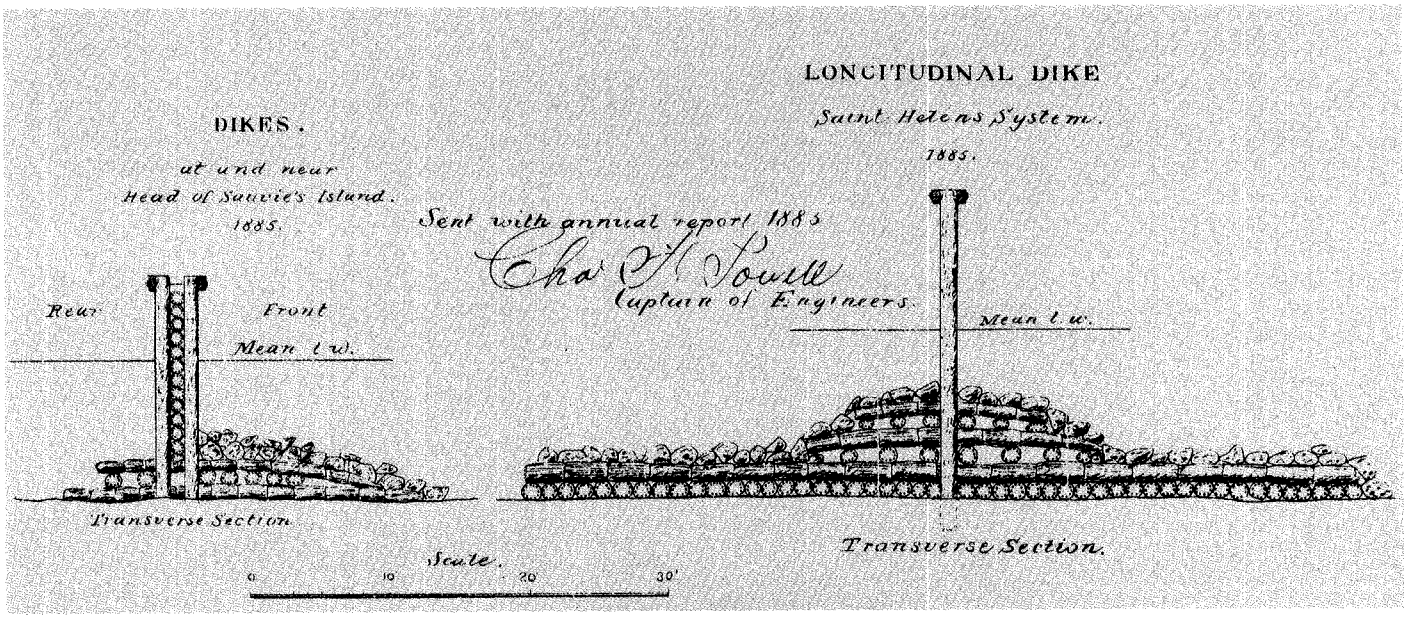
Similar operations in the next several years made the Cowlitz safe for navigation at high water. The construction of wing dams together with dredging operations in the last half



Major Gillespie's 1879 chart of Cowlitz River



right: Typical early pile driving operation for river dike, below: Section diagrams showing make-up of river dikes used on the Columbia River.



of the 1880s improved its depth, making it navigable at low water by the steamers then serving the area. Before the improvements, only half the length of the river had been navigable, and that during only a part of the year and at considerable risk. The River and Harbor Act of 1910 provided for a channel 4 feet deep and 50 feet wide from the mouth to Ostrander (9 miles), 2.5 feet deep and 50 feet wide from Ostrander to Castle Rock (10 miles), and 2.5 feet deep by 40 feet wide from Castle Rock to Toledo (18 miles). In the first 15 years after the original improvement an average of about $6 million worth of freight and rafted timber passed up and down the river each year.[13]

The Corps completed similar but smaller scale work on other rivers in Washington Territory. Four rivers which flow into the Puget Sound—the Nooksack, Skagit, Stillaguamish, and Snohomish—were either surveyed or improved, or both, during Major Gillespie's tenure in Portland. The settlers of the isolated areas drained by these rivers depended on them for transporting their produce to market. The chief work on these rivers to facilitate navigation was snagging, and a new snag boat was built in 1883 for this purpose.[14]

After his assignment to Portland in July 1881, Powell supervised surveys and improvements of the Chehalis River in Washington. In addition, he surveyed the Lewis River, Willapa Bay, Grays Harbor, and Olympia Harbor. No important work was done on the Lewis River until 1899. Before improvements were made, snags, overhanging trees, and shoals obstructed commerce on the Lewis, which was navigable for small, light draft boats only. The communities of LaCenter, on the east fork, and Woodland, on the north fork,

above: River boats on the Snake River near Lewiston, Idaho, circa 1860's.

functioned as heads of navigation. Under the 1899 River and Harbor Act, snagging, bank clearance and scraping were performed, five wing dams were constructed, and much rock removed. This type of work continued until 1913 at a total cost of $30,000. In 1913, Congress authorized a channel 6 feet deep and 50 feet wide from the mouth to the forks, 4 feet deep and 50 feet wide from the forks to LaCenter and Woodland. It also provided funds for annual clearing of the river 12.5 miles above Woodland. The Lewis River project, completed in 1928, cost $25,880.[15]

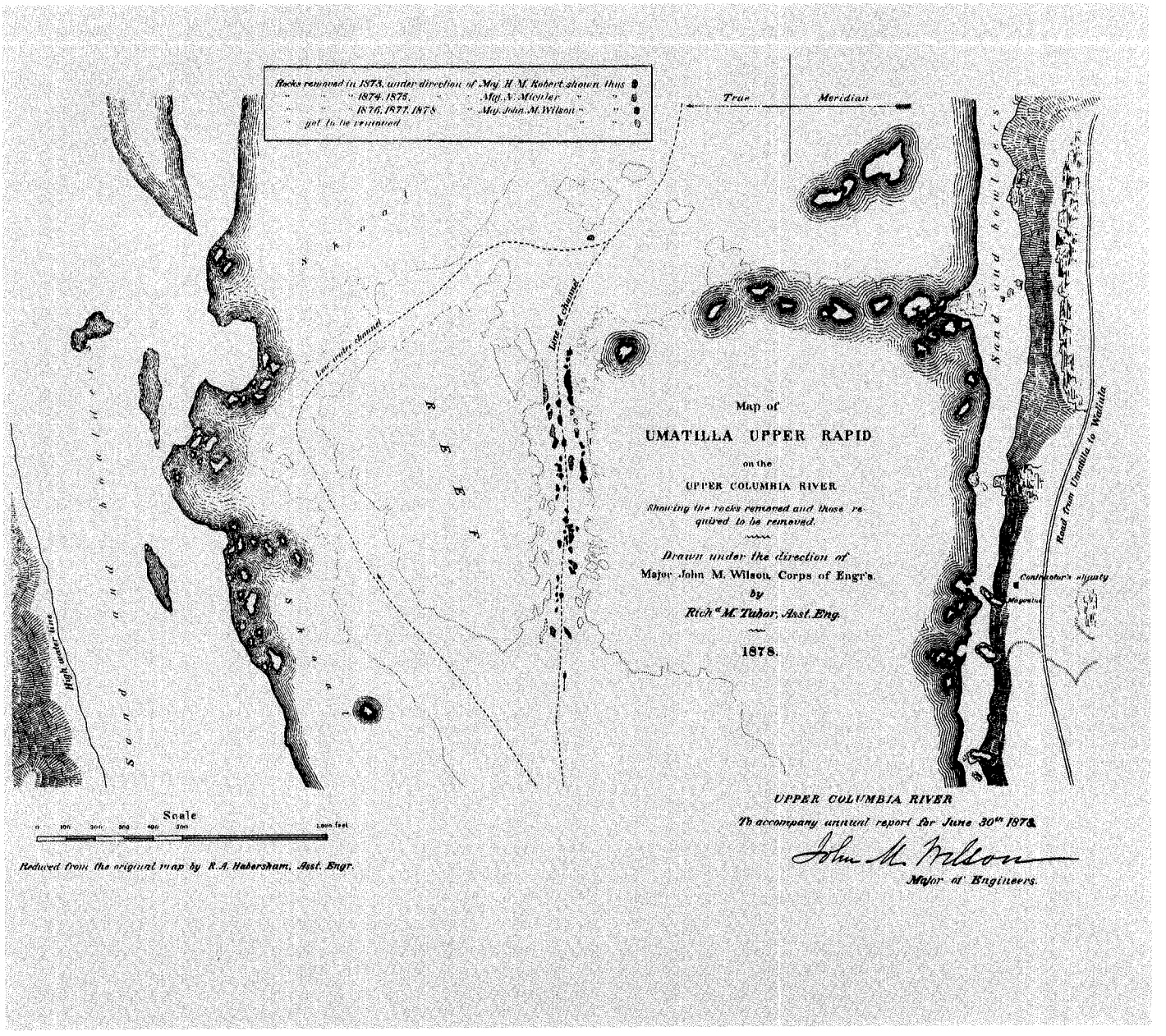
In the fall of 1881, Lieutenant Thomas W. Symons of the Corps of Engineers conducted a major survey of the upper Columbia River in Washington. His journey in a small skiff with two soldiers and several Indians took him from the mouth of the Spokane River to the Snake River. He mapped the river from the Canadian border to the Snake River and described and charted rapids and other obstructions.

Symons submitted to the War Department a thorough and lengthy report on the geologic and historic development of the river and its tributaries. He also sought to "show the economical relations of the Columbia to the surrounding country," . . . . and to answer "any questions which may arise in connection with the improvement of the river, to all persons who take interest in the development and the prosperity of the Northwest."[16] Included in his report, which was subsequently published as a congressional document, was the observation that the dry, almost desert, country in central and southeastern Washington Territory possessed rich, fertile soil that only required water for productive agriculture. This prophecy, while ultimately accurate, was based on the fallacious but then widely held notion that "rain follows the plow." As Symons phrased it:

> *An increase of moisture seems to come with an increase of cultivation, and every acre that is planted, tended, and harvested adds to the total agricultural acreage of the country and its capability of grain producing. This has been abundantly proven in Nebraska and other sections east of the Rocky Mountains. . . . This change has been produced by the westward progress of settlements, carrying along an increased rainfall.*[17]

Information gained from this reconnaissance combined with that from his surveys of central and southeastern Oregon in 1878 and that of the middle Snake River in 1881 gave Lieutenant Symons an unrivalled knowledge of the so-called Inland Empire of the Pacific Northwest.[18] Such intelligence served him well as engineer in charge of the second Portland Office in the early 1890s.

Work on the upper Columbia and Snake Rivers, under the supervision of the Portland Office, continued after 1888 for another 20 years much as it had for the previous ten: removal of rock, reef, boulders, ledges, and snags. In 1892, Congress authorized the construction of dikes at Wild Goose Island Rapids (73 miles below Lewiston) and Log Cabin Rapids (38 miles below Lewiston) on the lower Snake to provide deeper water. These small but fairly substantial structures, made of rubblestone and begun under Captain Symons, were completed by the fall of 1896 under Captain Harry Taylor. At Log Cabin Rapids, cribs implemented the dikes. At the time he finished this work, Captain Taylor reported that further dike work was justified by the growing commerce of the Snake. The high plateaus along the banks, he said, were "magnificent grain fields, and this grain



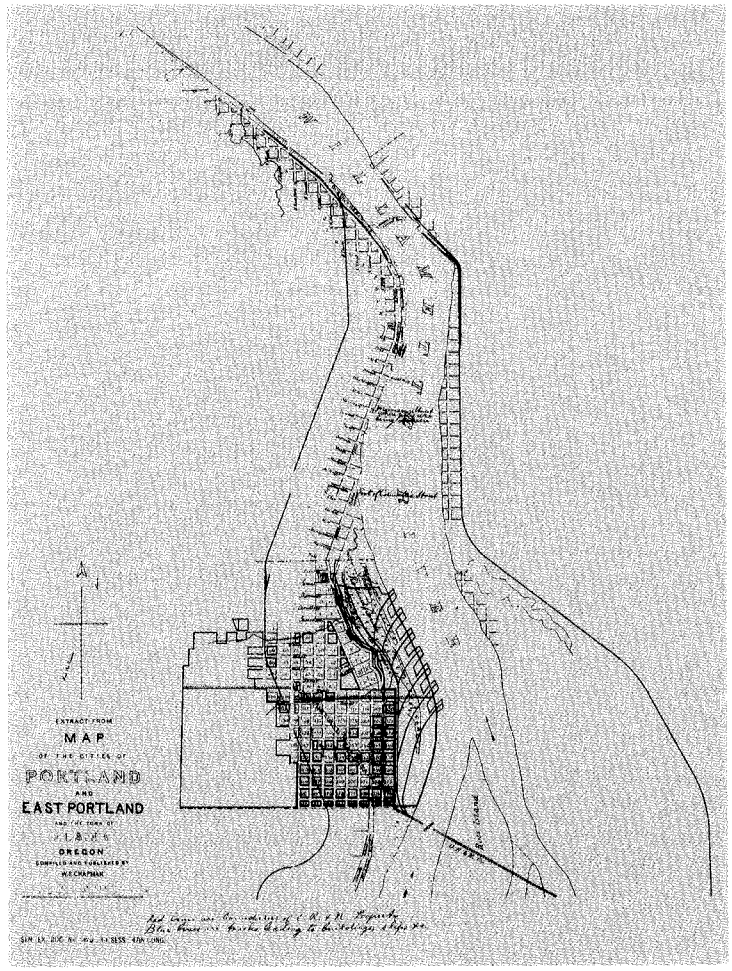
above: 1878 chart of Columbia River Upper Umatilla Rapid

naturally finds its way to market by the river. Along the bottom lands of the river valley are some of the finest fruit orchards in the Northwest."[19]

The turn of the century found the Corps of Engineers attending to the gravel shoals of the Snake and Columbia Rivers. The contract dredge *Norma* and the newly constructed U.S. dipper dredge *Wallowa* (1904) each worked on gravel shoals. The *Wallowa's* rake-like attachment reached down and scraped the obstructing gravel to deeper areas of the river. In 1907 Congress authorized the continuation of several types of work on the upper Columbia and Snake. By 1918, when improvements upriver from Celilo Falls to the mouth of the Snake River were completed, a total of $567,227 had been expended. Congress had approved the original project for this 124-mile stretch of the Columbia in 1872. The Portland District completed open river work on the Snake from its mouth to Pittsburg Landing, a distance of 214 miles, in 1918 at a total cost of $426,527. But not until the late 1930s did navigation on the upper Columbia and lower Snake show signs of sustained strength.[20]

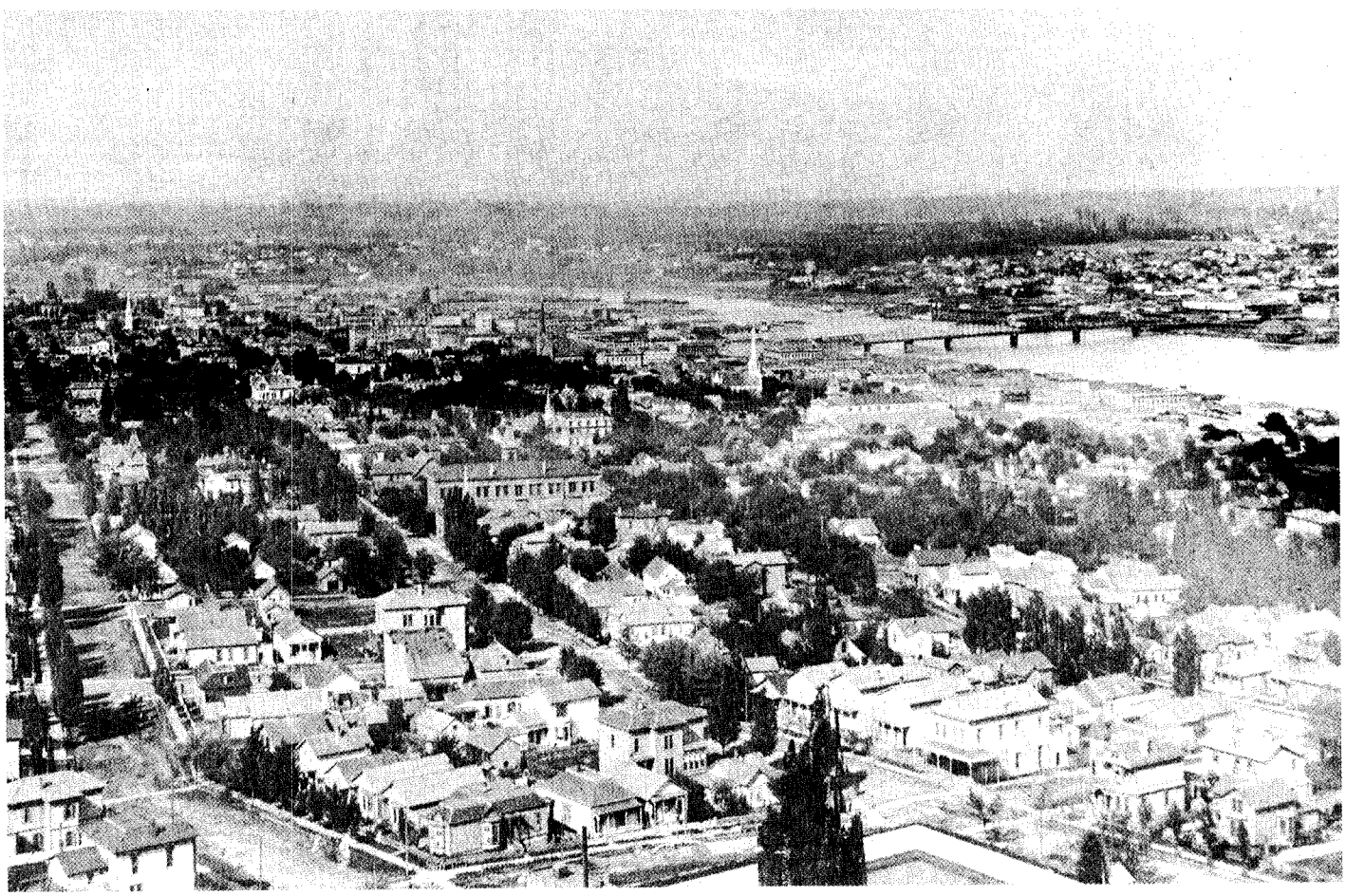
Bridging the Willamette at Portland

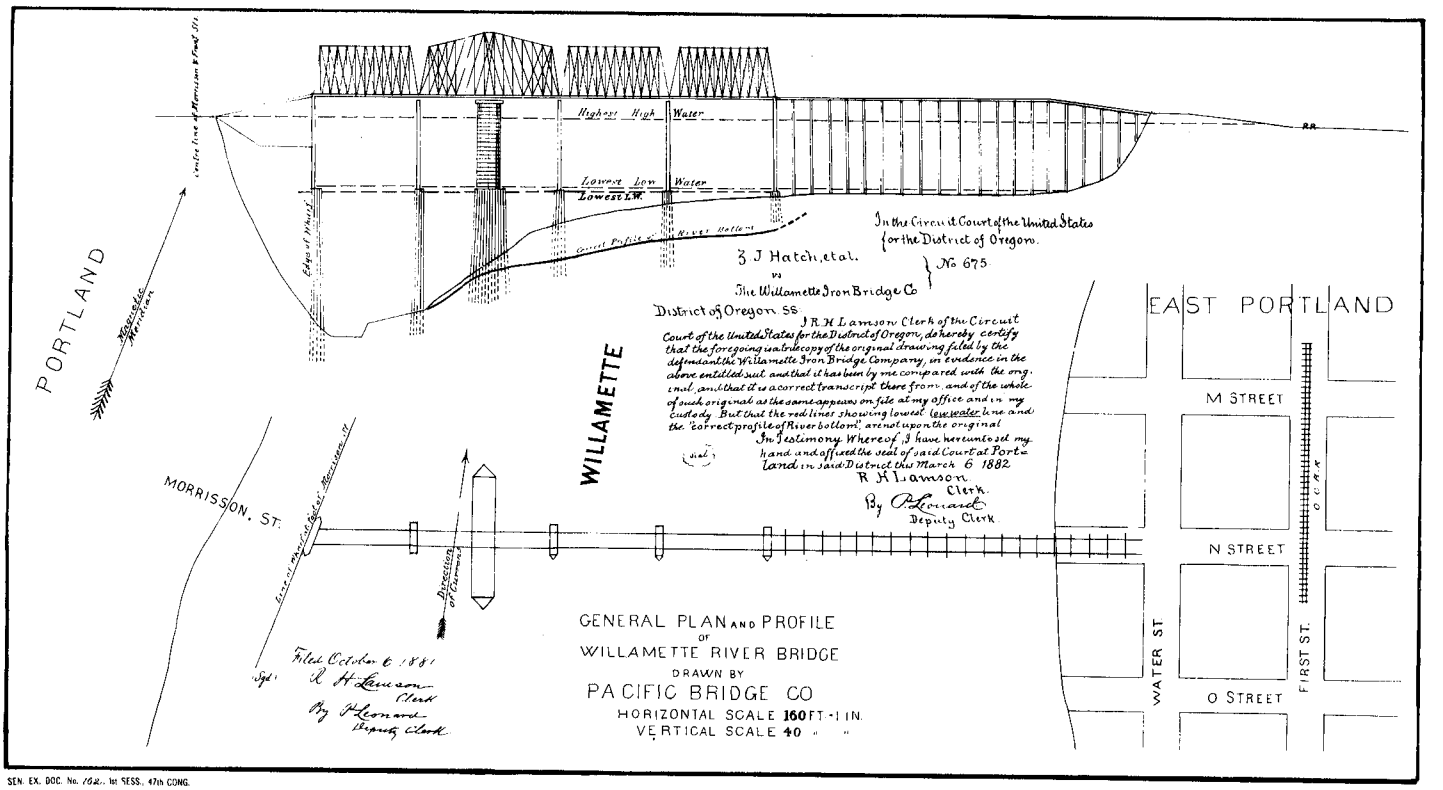
It had long been the dream of many to connect East Portland with the city of Portland by building a bridge across the Willamette River. As early as 1870, Congress authorized spanning the river, subject to the Corps of Engineers approval of the specific plan and location of the bridge. Major Williamson of the Corps of Engineers made surveys of the Willamette River for the bridge.[21] The Board of Engineer Officers in 1872 examined and approved, with modifications, plans for a draw bridge joining Columbia Street on the west side with Asylum Street on the east side.[22] Nothing came of these plans. Then in 1878 the



right: Map showing development of early Portland along the Willamette River.

below: Early photo of the city of Portland, (note newly constructed Morrison Street Bridge in upper right).





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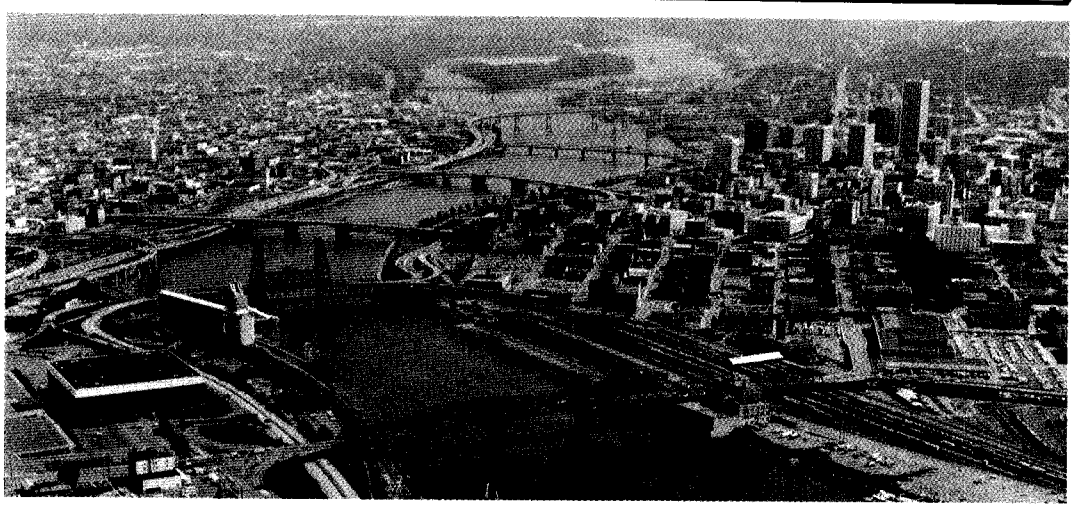


above: Plan and profile diagrams of the 1882 bridge over the Willamette at Portland. right: Today, Portland's bridges are reknown. Eleven bridges cross the Willamette between the falls at Oregon City and the river's mouth.

State of Oregon authorized a draw bridge connecting Morrison Street of Portland with N Street of East Portland. Commercial interests above this location joined the engineer in charge, Major Gillespie, in objecting to this bridge as a potential obstruction to navigation.

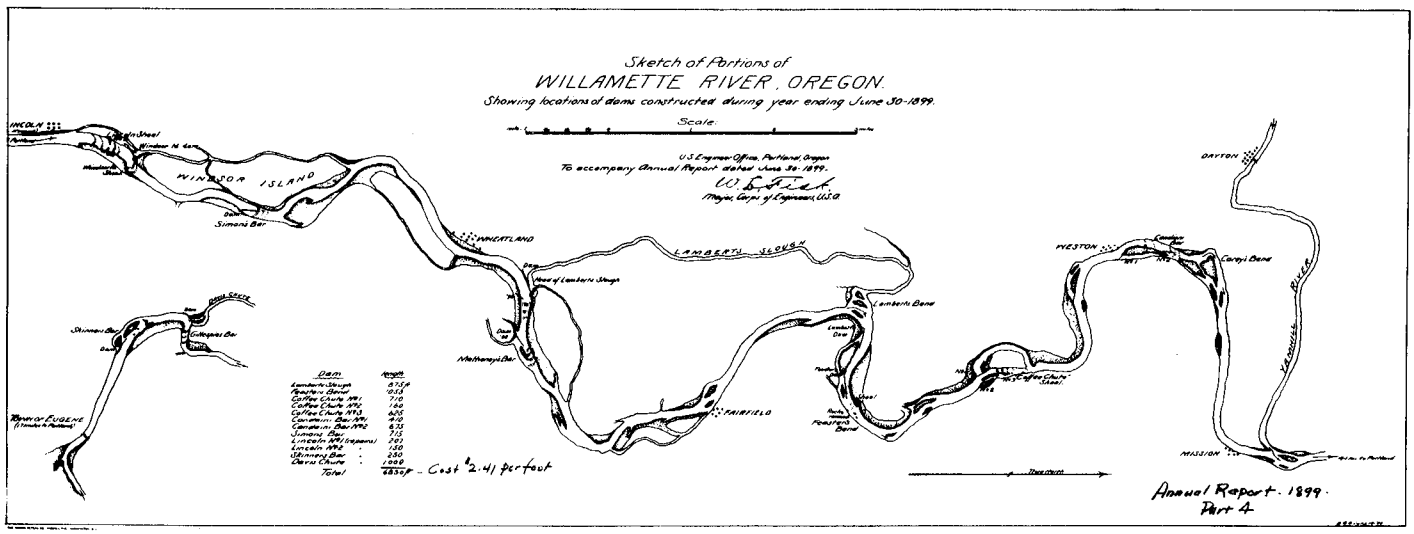
Gillespie's stance placed him in opposition to powerful interests in Portland who wished to bridge the Willamette where it passed through the heart of the city. The earlier bridge had been proposed for a location further upstream and thus above the main river wharf traffic. Again, no actual construction commenced at that time. When new legislation was introduced in the Senate in 1880 to authorize another span, the Corps was asked for its opinion. Once again, Major Gillespie stated that "in my opinion a bridge at Morrison street would most seriously interfere with the navigation of the river and the commercial interests of the city." However, in 1880 the Pacific Bridge Company began building a structure under the terms of the Oregon legislation and immediately generated renewed objections from commercial and shipping interests located upstream of the bridge.

Gillespie continued to disapprove of a bridge with such narrow drawspan dimensions as those proposed for the Morrison Street location. Shipping and railroad interests opposed to the Morrison Street bridge eventually obtained a federal court injunction, based largely on evidence submitted by Major Gillespie, which delayed further bridge construction for several years. Meanwhile, the submerged piers of the unfinished structure constituted a dangerous hindrance to navigation in the Portland harbor and a continuing problem for Gillespie's successor, Captain Powell. Eventually, Powell succeeded in getting the decayed piers removed. Nevertheless, when finally constructed in 1887, the Morrison Street bridge,

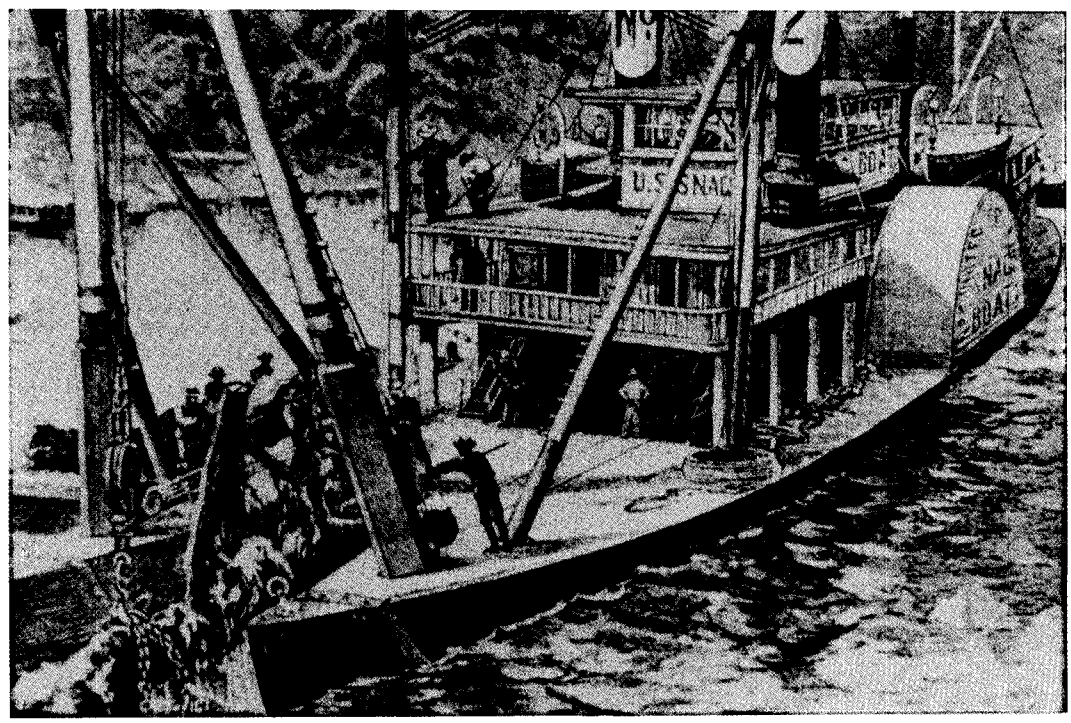
although having different specifications than the original plans, still proved an obstruction to navigation in the harbor.[23]

Between 1887 and 1894, three more draw bridges were built within the Portland harbor. Boards of Engineers, convened to pass on the specific plans for them, considered all of the structures as unreasonable burdens on navigation. However, political pressure by the financial interests concerned in the bridges successfully overcame the engineers' objections before the Secretary of War, in Congress, and in the state legislature. Construction of these bridges resulted in the movement of ocean-going shipping and wharf facilities to the lower reaches of the Willamette River in Portland.[24]

Bridges were not the only potential obstructions to navigation in the waterways of the Pacific Northwest. In the late 1880s, both Majors Powell and Jones complained that some salmon pound-nets and fish-wheels in the Columbia River obstructed free and safe navigation and to some degree caused shoaling in the river channel. Both men recommended that the location of such structures in navigable waters ought to be regulated by the War Department through the Corps of Engineers. The debate over the obstructive nature of fish traps in the Columbia River proved a lengthy controversy. District engineers also had occasion to complain about the dumping of obstructing refuse, such as sawdust and other mill waste, into navigable rivers. Such recommendations, coupled with a broader Corps desire to regulate bridges, establish harbor lines, and police obstructions in navigable waterways, ultimately led to national legislation in the matter. Sponsored by Senator Joseph Dolph of Oregon, Congress passed, in the Rivers and Harbors Act of 1890, the first comprehensive anti-obstruction law. A stronger measure was enacted in 1899.[25]



above: 1899 chart of a section of the Willamette River.

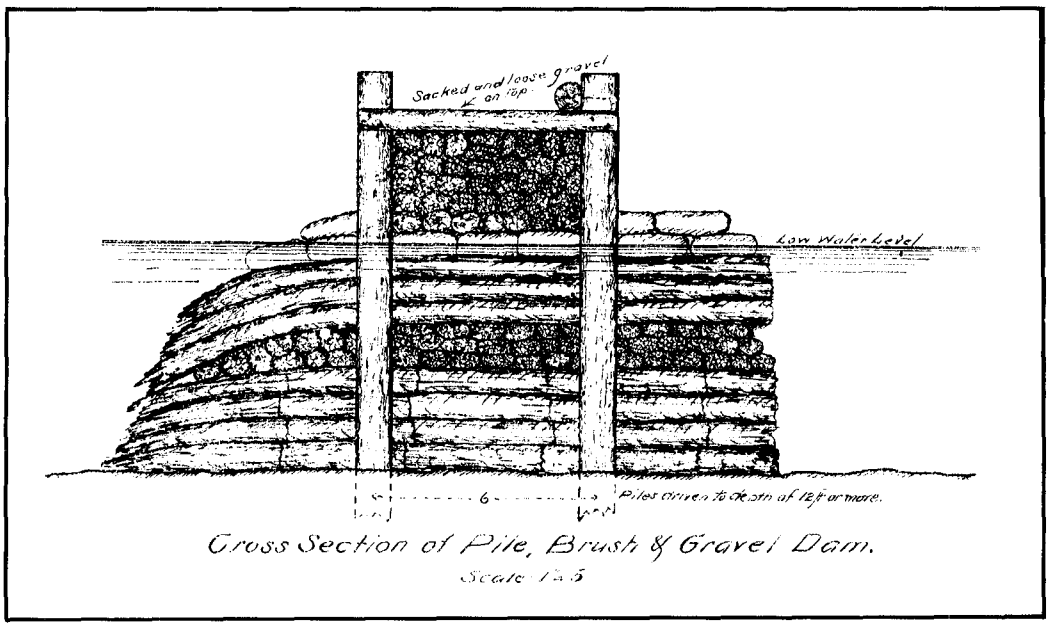


right: The Wallowa *snagboat used for clearing debris from river channels.*

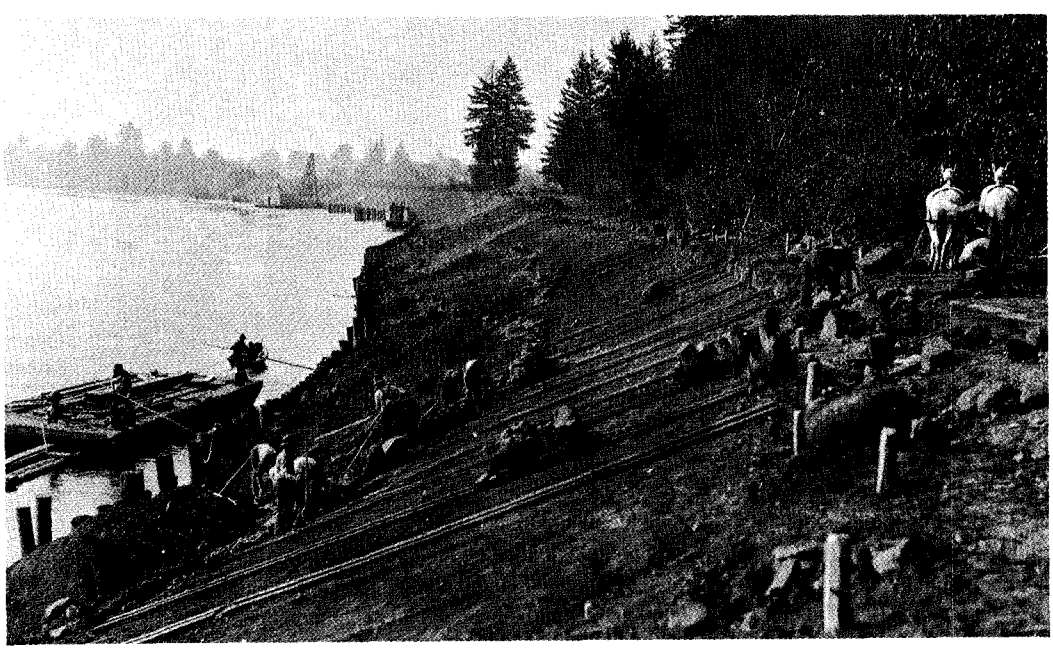
Navigation on the Upper Willamette

Clearing, snagging, damming, scraping, and blasting operations during the 1880s kept the upper Willamette open for navigation for flat bottom pole boats year-round as far as Salem, and nine months of the year to Eugene. Steamboats could navigate safely only at high water. Bank revetment (covering of a river-bank with stone, masonry, or brush fascines to prevent the bank from washing out) on the Willamette was first done during this period. In 1892, heavy log traffic on the Yamhill justified the authorization of similar improvements as far as McMinnville.[26]

The River and Harbor Act of 1896 provided for the maintenance of minimum channel depths in the Willamette and Yamhill Rivers. This improvement would furnish a connection with the Portland-to-the-sea project. Controlling works such as dams and dikes plus dredging operations sought to maintain 12 feet of water from Portland to Clackamas Rapids near Oregon City (11 miles), 3.5 feet of water from Clackamas Rapids to Corvallis (107 miles), and 2.5 feet of water from Corvallis to Eugene (53 miles). On the Yamhill a lock and dam would be built and snags removed. These improvements allowed lightdraft steamboat traffic to navigate the Willamette as far as Corvallis year-round. For nine months of the year, steamboats could get to Harrisburg on the Willamette and McMinnville on the Yamhill. The dams built were not storage dams with the capability to release water; rather, they merely kept what water was on hand at a given time in a smaller channel. For example, a dam would be constructed of logs, rocks, and brush to connect the bank with an island, thereby diverting all the water to one channel. However, dredging activities were mainly responsible for the improved depths in these rivers.[27]



Typical dam constructed on rivers to force full velocity of water into one area to scower channel clean of sand bars

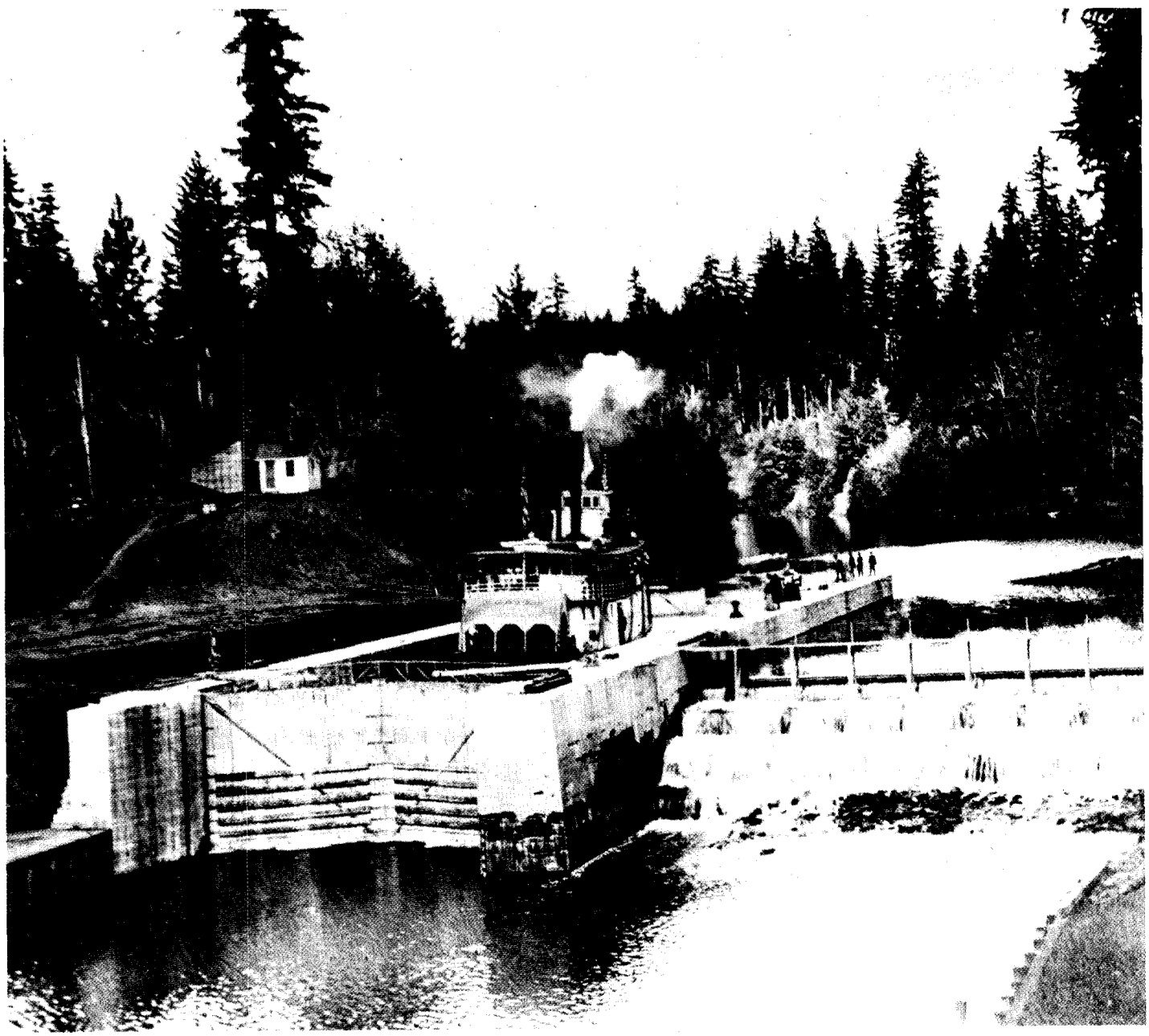


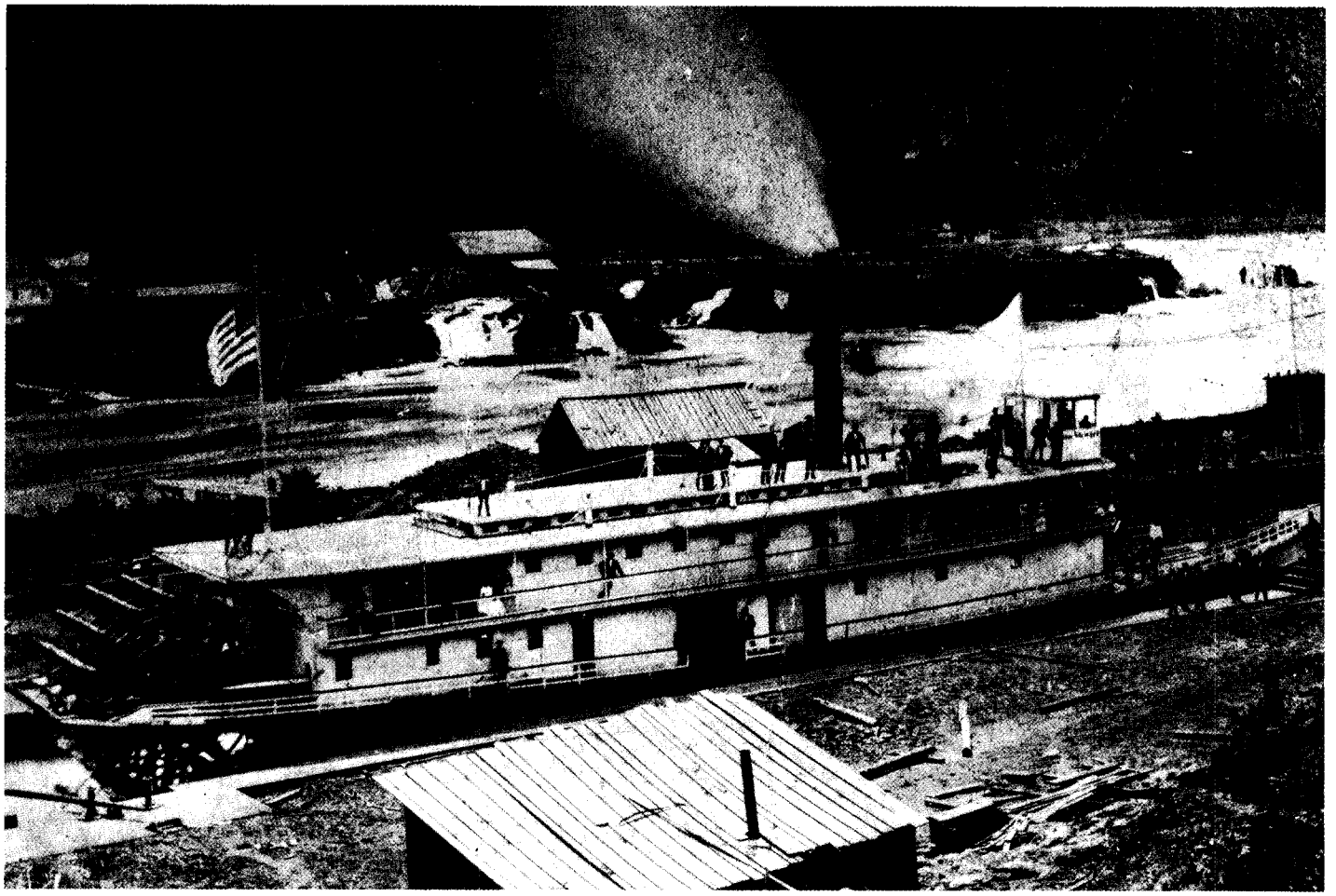
Typical early bank revetment work

In 1904 Major W.C. Langfitt, Portland District Engineer, recommended elimination of the 20-mile section of the Willamette from Harrisburg to Eugene from the project. He thought traffic insufficient to justify the maintenance expense there. What little movement there was consisted mainly of logs which did not require improved depths. In 1912, the 12-foot channel was abandoned when a 6-foot deep by 150-200 foot wide channel from Portland to Willamette Falls was authorized. In 1930, the Corps deepened this stretch of the river to eight feet. In the intervening years, the same dredging, snagging, diking, revetting, and repair work continued on an annual basis.[28]

Based on a survey of the Yamhill River by Major James Post in 1895, plans for a small lock and dam on the river were drawn up the following year. Located near Lafayette, the dam was to provide 3.5 feet of water as far as McMinnville year-round. The dam held and released water to regulate flow, and the lock, 40-feet wide and 210 feet long, lifted water craft 16 feet over the dam. After a preliminary examination of the Yamhill River in 1892, Major Handbury had opposed building such a lock and dam, citing the small amount of commerce on the river. Congress, however, determined otherwise and appropriated funds for the project. In 1898 the contract for the work was let to Normilie, Fastebend, and McGregor of Astoria, which completed the project by October 1900, at a cost of a little over $72,000. As river historian Randall Mills wrote, "it was a pleasant lock where the tender could grow gray in solitude, undisturbed in his meditations, because only an occasional steamboat came along to wake him up." Freight on the Yamhill steadily declined until only one ton went through the lock in 1921. However, the lock and dam served the useful

below: Lock and dam on the Yamhill River.





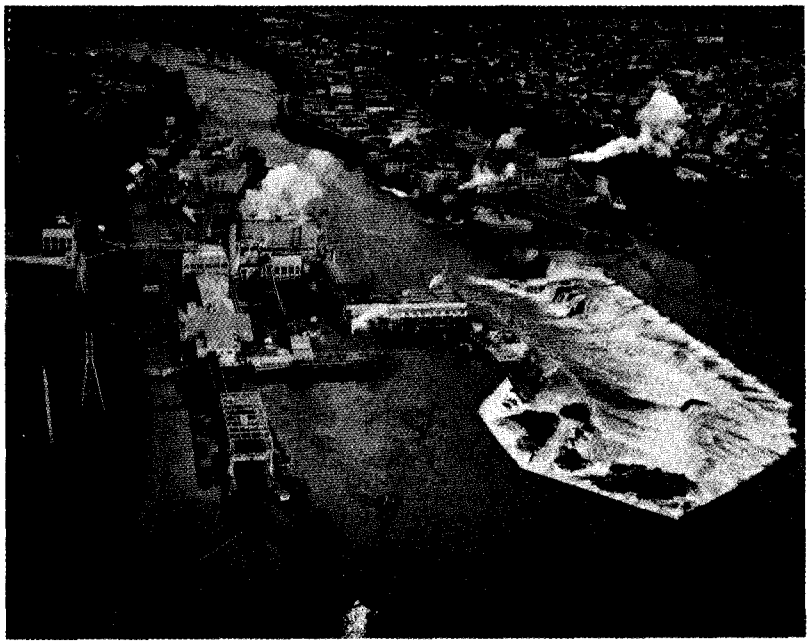
above: Riverboat passing through the locks at Oregon City.

purpose of supporting log traffic from 1926 until after World War II. In 1954, the Corps discontinued operation of the Yamhill Lock; two years later Yamhill County acquired the lock and dam and maintained the area as a park.[29]

The Willamette River's navigational value dated from construction of a lock system at the 40-foot Willamette Falls in 1873. The lock system was comprised of four locks, each with a lift of about ten feet, a canal basin, and a guard lock. The total length of the project was about 3,500 feet. The People's Transportation Company built the locks at a cost of $600,000 that included financial support from the State of Oregon. In 1876 the locks were sold to the Willamette Transportation and Locks Company, a corporation that eventually came under the control of the Oregon Railway and Navigation Company, which in turn, sold the locks in 1892 to the Portland General Electric Company. During much of this period there was considerable political activity aimed at getting the State of Oregon to purchase the locks, for it was widely believed that the tolls levied for use of the locks impeded the development of the Willamette Valley. These efforts failed, however, and the people of Oregon turned to the Federal courts. Portland District Engineer Major Walter Fisk carried out a preliminary examination and a survey of the locks; and in 1899 a Board of Engineers submitted a report to the Chief of Engineers, stating the desirability of federal government ownership. But the Portland General Electric Company, apparently overestimating the desire, set the price on the locks (which would require substantial repairs) at $1,200,000. The Corps declined to purchase at this price, appraising the locks at about one-third that amount. Ownership of the locks changed hands one more time, and finally, after much negotiation, the Corps of Engineers purchased the locks from the Portland Railway Light and Power Company for $375,000 in 1915.[30]

Included in the authorization for purchase was a provision for rehabilitation of the locks. This work included renewing the gates, timberwork and fenders, and the construction of a division wall to separate the canal from the powerhouse intake of an adjacent private power generation facility. This was to be done at a cost of about $600,000, of which the State of Oregon would provide half. The Corps completed the rehabilitation project by 1921.[31]

The Flood Control Act of 1938 and the River and Harbor Act of 1945 provide for rebuilding the Willamette Falls Locks and converting the existing flight of four locks into a single lock with a length of 400 feet and a width of 56 feet, and a guard lock. To date, funds



Today, the locks at Oregon City still operate, enabling river traffic to bypass Willamette Falls.

have not been appropriated to carry out reconstruction. Meanwhile, Willamette Falls Locks continues to carry the load. During the 1970s, 800,000 tons of traffic yearly passed through the locks. In 1974, the locks were placed on the National Register of Historic Places, which includes sites of national historic significance.[32]